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How Earned Value Got to Primetime A Short Look Back and Glance Ahead

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Introduction

For Earned Value Management, PMI 2000 will be remembered as a major milestone for reasons other than its millennial significance. The Project Management Institute conference in Houston is the first to feature a track dedicated to performance management, sponsored by the College of Performance Management. The College considers EVM to be an essential tool for effectively integrating technical, schedule and resource (or cost) management on complex projects. Until now, EVM had limited exposure at PMI conferences, usually courtesy of the Aerospace and Defense Specific Interest Group. That affiliation reflects EVM's origins in defense contracting. Before becoming part of the PMI family, EVM disciplines were championed by the former Performance Management Association (now the College of Performance Management).

So the College bids a fond adieu with thanks to the Aerospace and Defense SIG. This first paper to be presented under College of Performance Management auspices will review how EVM arrived at this point in the history of project management and speculate on how it will evolve. The purpose is not to teach EVM, but to explain its context in the world of project management and to introduce to the broader PMI community the performance management resources available through PMI's first college.

We can see how rapidly EVM has grown by taking a glance at EVM conferences around the world. As recently as the mid-1990s, the only public venues for EVM were PMA conferences and an annual conference sponsored jointly by PMA, the Society of Cost Estimating and Analysis and the National Defense Industrial Association in Tysons Corner, Virginia. Now, any given year offers choices for world-class conferences in many countries:

- Australia
- Canada
- Japan
- Sweden
- United Kingdom
- United States

This list is certain to grow, posing a challenge for those who are directly involved in EVM to support all the events. But it is exciting to watch new ideas take root in country after country as first government, then industry adopt the EVM model that originated as a contract requirement in the United States Department of Defense.

Meanwhile, that model did not remain static in the United States. The EVM concepts continued to evolve, with American industry assuming a larger role and government

correspondingly less. One Australian defense official observed that the rapid changes being experienced in the United States complicated matters in Australia. He said that as Australia was learning the game, the United States was changing the rules and moving the goalposts.

As managers in other nations gained experience with EVM they found innovative ways to use it. For example, Australia pioneered payment by earned value. Canada emphasized small project management, as opposed to the major projects reflected in United States defense acquisition policy. And Japan joined the international EVM community not from a defense point of view, but from the Ministry of Construction.

What is the state of EVM today? Has it indeed reached "primetime" as an enduring management concept or will some "new big thing" replace it? This paper examines those questions and others from a singular viewpoint – that of a former public servant who was the senior program analyst in the Office of the Secretary of Defense with responsibility for contractor performance management. In that position, the author came to appreciate EVM as an effective method to manage complex defense contracts. And through cooperation with industry, academia, professional associations, other government agencies and other countries, the Department regained its reputation as a world leader in project management. The reputation is well deserved. Data show that cost and schedule "surprises" are a thing of the past in defense contract management; indeed, some programs have evolved to that idyllic state in which cost savings are harvested for other uses.

EVM History

Unlike commercial enterprises, whose success or failure is a function of the bottom line and customer satisfaction, Department of Defense acquisition programs face a more complicated equation. Competition with other programs may lead to overly optimistic promises for performance, delivery and cost. By the time problems in those areas become visible, the significant amount of sunk investment cost militates against program cancellation. The resulting dilemma – to add time and money or cut production quantities, or both – has played out repeatedly throughout defense acquisition history. Programs continued because the systems were needed, sometimes at costs dramatically greater than originally estimated and at quantities less than desired.

Also unlike most commercial projects, defense programs frequently are called on to do things that have never been done before. The Department of Defense recognized as early as the 1950s that its increasingly complex weapon systems development contracts demanded more sophisticated management techniques than were generally used in industry. Early attempts to solve the defense management problem led to development of new tools based on PERT, the Program Evaluation and Review Technique (Driessnack 1999).

PERT-COST, a resource loaded network management technique, originated in the Navy as a contract requirement, with each government customer defining its specific requirements. The Department was leading the way in developing modern project management techniques. On the other hand, the uncoordinated initiatives resulted in industry anxiety at the proliferation of different contract requirements and the "how to manage" nature of those requirements.

Those conditions – increasing program complexity, inadequate industrial management techniques and industry concern – eventually led to EVM. But the path was not straightforward. At first, the services could not agree on a common approach. The Air Force walked out of interservice discussions because they felt PERT-COST was too rigid (agreeing with the Army in that regard). Pioneers led by an Air Force officer, Hans "Whitey" Driessnack (who would retire as a Lieutenant General), investigated the best management practices used by leading American companies. The Air Force captured the practices as criteria for effective management in the "Cost/Schedule Planning Control

System" (C/SPCS) specification. The promise held out by this innovative approach diminished as multiple Air Force versions emerged. It would take a broader perspective to overcome the parochial inter- and intraservice views.

In 1966 the Office of the Secretary of Defense resolved the issue by adopting the Air Force specification and coordinating it with the other services. In 1967 the Department of Defense issued Instruction 7000.2, "Performance Measurement for Selected Acquisitions." DoDI 7000.2 mandated a uniform Department of Defense procedure for compliance by industry with Cost/Schedule Control Systems Criteria. C/SCSC thus succeeded C/SPCS and contract-peculiar requirements. The C/SCSC instruction marked the birth of a revolutionary way of working with industry – and of EVM. All services would use the same management criteria for contracting with defense industry on major programs, criteria that represented the best management practices used in American industry and that required earned value management as the integrating technique.

The reader may have noted from this discussion that the Department of Defense is not a monolithic organization. Military service rivalry is not restricted to military academy sports. When the Department issued DoDI 7000.2, industry feared that the services would not implement it consistently and made those fears known. Then Secretary of Defense David Packard directed the services to get industry involved and to set up EVM courses at the Defense Systems Management School (now Defense Systems Management College).

In June 1970, government and industry conferees at Andrews Air Force Base discussed implementation procedures (Driessnack 1999). For example, industry wanted broader interpretation for managing material in EVM. The government responded by appointing an industry representative to write the material guidance. And so began a government/industry alliance characterized at times by hostility and mutual suspicion, but leading eventually to extraordinary cooperation.

The project management challenges faced by defense managers decades ago are even more complex today, exacerbated by a smaller share of the national budget for defense and a shrinking industrial base. The Air Force F-22 Raptor fighter, currently in advanced development to replace the F-15 air superiority fighter, provides an excellent case study. The Air Force requires the F-22 to fly faster than the speed of sound without using fuel-guzzling afterburners. It also must incorporate advanced stealth characteristics and "heal" itself by automatically reconfiguring its sensors to make up for equipment damaged in combat. No commercial equivalent exists for these advanced capabilities, leaving it to government to assume much of the cost risk for their development.

At this writing, the F-22 remains controversial. With billions of dollars already sunk in its development, congressional pressure is threatening to halt production until critical testing demonstrates adequate progress in the avionics software. The stakes are high. The Clinton administration requested \$2.55 billion for ten airplanes in next year's budget, plus \$1.4 billion for continued development as part of a total program cost estimate of \$62.5 billion (Schneider 2000).

With no marketplace to set prices, such programs require the very best project management possible to protect the public interest. That environment spawned EVM – the most effective way known to integrate project work scope, schedules, and resources with risk management.

EVM Evolution

The EVM policy that evolved in the 1970s was in the traditional "oversight" mode then used in the Department of Defense. The Office of the Secretary of Defense established high level policy, leaving implementation to the military departments. Disagreements among the military departments about policy interpretation led to compromises, typically resulting in more detailed policy guidance. Add to the mix industry requests for "clarification" of that guidance and the stage is set for regulatory creep – the inexorable

growth of government regulation. C/SCSC was no exception, giving rise to a subculture of government and industry experts and consultants.

Another Air Force EVM pioneer, Robert Kemps, moved to the Office of the Secretary of Defense to head the performance management oversight organization. A noted EVM author, he viewed his primary missions as oversight and teaching, and his primary problem as senior staff turnover. Political appointees came to the Pentagon bringing new and often short-lived management initiatives. By the time an initiative showed its shortcomings, the proponent was gone. Meanwhile, the EVM criteria did not change significantly in 35 years, a fact Mr. Kemps attributes to the common sense interpretation, continuity and pragmatism provided by his successor, Gary Christle (Kemps 1999).

While these evolutions were occurring in the Pentagon, the author was gaining EVM experience in the Army Materiel Command and its subordinate acquisition commands. Those positions led to his eventual assignment as Chief of the Contract Performance Analysis branch in Materiel Command headquarters and then to selection by Mr. Christle in 1982 as senior program analyst for contract performance management in the Office of the Secretary of Defense. They would remain together until the author's retirement from public service in June 1999.

By the early 1980s, Mr. Christle was becoming aware that C/SCSC was not achieving its intended objectives. He had three important vantage points: contract oversight through Department of Defense internal reporting, staff participation on service C/SCSC reviews and periodic meetings with industry. The most pressing issues concerned the shipbuilding industry, which had not implemented C/SCSC concepts to the same extent as the aerospace industries. Those issues were largely resolved through his office's leadership in the late 1980s. They worked with industry and the military departments, foregoing the traditional oversight model in favor of teamwork and cooperation.

As the 1990s dawned, it became apparent that C/SCSC implementation and reporting issues were not peculiar to the shipyards when Pentagon analysts identified cost and schedule problems on a series of high profile programs. The most notorious was the Navy's A-12 "Avenger" aircraft development program. Mr. Christle brought the huge overrun to senior management's attention, triggering a series of events that would lead to the multi-billion dollar program's cancellation. Several years later, shock waves continue to echo through expensive, prolonged litigation.

The Turning Point

The A-12 debacle had serious consequences. Senior civilian officials and military officers were replaced, resigned or retired. Not long afterward, similar cost and schedule revelations hit the Air Force C-17 transport aircraft development program, with similar results. Although the C-17 program survived, cancellation was considered seriously and civilian and military careers and corporate reputations were damaged. Just as in the A-12 case, earned value analysis revealed that the problems were apparent, if not avoidable, long before the contractors and program managers acknowledged them.

These episodes and others showed convincingly the value of EVM for early warning. However, they also showed that EVM information was not being used effectively throughout the Department for management purposes. Instead, EVM responsibility in both government and industry typically was assigned to program control specialists and viewed as a financial reporting requirement. The time was ripe for change, but the needed changes were resisted by the EVM bureaucracy.

The Office of the Secretary of Defense took an active leadership role. It overhauled the Department's EVM organization, a committee consisting of equals with no permanent chair, and instead assigned the lead role to the Defense Contract Management Command. Industry was invited to participate and in fact to assume responsibility for industrial management concepts. EVM was redefined in defense regulations as a project management process rather than a financial requirement. These steps built a framework

that would result in industry issuing its own standard for EVM, ANSI/EIA 748-98 "Earned Value Management Systems," which in turn was adopted by the Department of Defense in 1999.

The Department also provided access to its extensive database, consisting of hundreds of contracts, to graduate students at the Air Force Institute of Technology. The students produced an impressive body of research that improved EVM understanding and use by defense managers. The comprehensive bibliography of EVM literature is available on the web at www.cpm-pmi.org

It is important to understand that EVM was not preordained as the management solution for the Department of Defense. Alternative solutions were sought but none were forthcoming. Industry agreed that EVM consists of generic management principles that should be implemented for all projects, but not to the same extent; "one size fits all" rarely works in project management. Leading defense companies have begun to reconcile their government and commercial management processes. For example, The Boeing Company issued in 1999 a company manual titled "Integrated Performance Management Practice" (© Copyright 1999 The Boeing Company), intended for use by all Boeing organizations. It states "The application of the IPMP will vary based on environment, customer requirements, size, scope, risks, complexity, and individual organizational needs."

And as indicated in the introduction, other countries adopted Department of Defense EVM principles for their own needs. Their participation increases confidence that the principles are universal in application. Japan's participation is especially noteworthy in that regard. Following a comprehensive worldwide search for best management practices, officials from the Ministry of Construction announced in February 1999 their decision to adopt EVM, to implement it through pilot programs, and to issue a national standard by 2002.

The Department of Defense's success in reforming EVM is apparent in cost growth history tracked by the Office of the Secretary of Defense. In November 1999, the total overrun on more than 100 of the Department's largest, most risky contracts (flexibly priced contracts requiring compliance with EVMS and reported periodically to the Office of the Secretary of Defense) was only 5.5%, or \$1.2 billion (Christle 1999). The contracts in aggregate were 66% complete and represented \$72.8 billion in target value. The A-12 and C-17 development contracts alone were overrunning by more than that a few years ago.

Success extends to legacy programs also, such as the F-14 Tomcat Navy fighter. Long out of production, the F-14 has a new lease on life because the program management office implemented project management techniques (including EVM) in naval aviation depots and other facilities. In March 2000 the program received the Vice President's National Performance Review "Hammer" Award for saving and returning to its sponsors \$268 million, the result of a project to extend the fatigue life of the airframe.

Into the Future

For some thirty years, the United States Department of Defense was the center of the EVM universe. It remains an active participant and continues its excellent [EVM web site](#) but has relinquished EVM "ownership" to industry. Just what or who is "industry?" And what does "ownership" entail? Answers to these questions are beginning to emerge, with the College of Performance Management in a central role.

The National Defense Industrial Association is active in defense circles, but its interests are defined by its membership. While some member companies (such as Boeing) have substantial commercial interests, others do not. The National Defense Industrial Association assumed the "ownership" mantle for defense industry and coordinated with other associations to write the industry EVMS standard. This cooperation extends to all interested parties. The Association participates regularly in EVM conferences and invites

government, other industry and international representatives to its meetings.

In the United States government, the Executive Office of the President, Office of Management and Budget has incorporated EVM principles in its budget planning and execution guidance to all government agencies. Central responsibility resides with the Office of Federal Procurement Policy, which each year evaluates agency progress toward meeting the performance based acquisition requirements embodied in federal legislation. The agencies are making progress but will need support to meet their cost, schedule and performance goals.

The College of Performance Management, whose membership includes many government and industry EVM experts, is taking the lead to make EVM available to the wider project management community. Recognizing the void in guidance outside the government, the College is integrating EVM into the PMBOK® Guide. The College will translate the government jargon associated with EVM and document the “unwritten rules” and understandings that evolve in any discipline over the years. Members are writing a PMI practice standard on earned value to provide practical guidance on using EVM as an integral part of project management.

In addition to its new role in the annual PMI conference, the College of Performance Management sponsors its own conference each spring. It also co-sponsors the annual “Integrated Program Management” conference in Tysons Corner, Virginia. College members extend a cordial welcome to our PMI colleagues to join us in improving performance measurement and management.

The College of Performance Management and EVM have arrived at this point through a lengthy maturation that began in the Department of Defense and its industrial base and has spread around the globe. Along the way, EVM implementation was reviewed by auditors and reformers and was compared with new (or recycled) management techniques: PERT, CPM, TQM, JIT, ABC, ABM, CCPM. In every case, EVM came through intact and improved. It did so because the principles are broad enough to accommodate new things and because EVM proved itself in what is perhaps the world’s most demanding project management environment – thousands of contracts on hundreds of defense programs.

The College of Performance Management represents a valuable new PMI resource, the right organization at the right time to build on the government, industry and Performance Management Association EVM legacy by making the best practices in performance management accessible to the global project management profession. It’s primetime for EVM.

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Comprehensive bibliography of EVM literature available on the web at www.cpm-pmi.org

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